end of the gas chamber cannot be cooled below the temperature of the entering gas, and the products of combustion cannot be cooled below the temperature of these checkers, so that the heat carried in by hotter fuel is carried out by hotter waste gases, and no economy is obtained."

Moreover, the outlet temperature of the waste gases can be unfavourably influenced, owing to too long intervals between reversals, which is easily apparent from the following consideration:—The gas coming from the producer yields on combustion with cold air a certain temperature of combustion, assumed at 1,100° ; and it is clear that one is able to heat the entire furnace system up to the chimney flue nearly to this temperature, if one allows the gas to pass long enough in one direction. The temperature at the outlet end will only thus be lowered as much as corresponds with the loss of heat in the entire furnace system owing to radiation and conduction, and one naturally is always endeavouring to make these losses as small as possible. When in this manner one end of the furnace has been warmed up, and one allows the gas stream to be drawn through the furnace in the reverse direction, one obtains preheated air and gas in the furnace, whereby the temperature of combustion is raised, and the second half of the furnace admits of being brought in a shorter time to the temperature of the first half of the furnace than this itself required, and this first half of the furnace could not, therefore, cool down again to the temperature at the commencement. In this way it is thus possible to overheat at the bottom even a furnace with very large chambers, and to obtain much too high outlet temperatures.

In the calculations in the previous section, it is assumed that the waste gases are drawn into the chimney at 700°, a temperature below which will be observed in the least good-running open-hearth furnaces. But the waste gases themselves per kilogramme of carbon burnt at this relatively low temperature (one very frequently finds much more) carry off (vide Table M, p. 124) 3,000 to 4,000 calories, i.e., more than 40 per cent, of the total energy liberated from the fuel Up to the present this quantity of heat has completely gone to loss, and there is little prospect that out of it an at all considerable